

Depot Maintenance

UID IPT

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THE USE OF STENCILS TO CREATE DIRECT PART MARKS

By

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Patent #'s

6,220,333 B1

6,666,255 B1

6,666,257 B1

Presentation Topics

- ❑ Point-of-Cast Identification Methods
 - ❑ Sand Casting
 - ❑ Permanent Mold Casting
 - ❑ Investment Casting
- ❑ Thermal Spray Direct Part Marking
 - ❑ Combustion Spray
 - ❑ Electric Arc Spray
 - ❑ High Velocity Oxygen Fuel (HVOF)
 - ❑ Spray And Fuse
- ❑ Direct Part Marks for Composites
- ❑ Network Based Decoding
- ❑ New NCMS Project Goals
 - ❑ Taylor Thermal Spray Alloys to Overhaul Process
 - ❑ Rapid Induction Fusion of Data Symbols
 - ❑ Under Paint Thermal Imaged Data Symbols

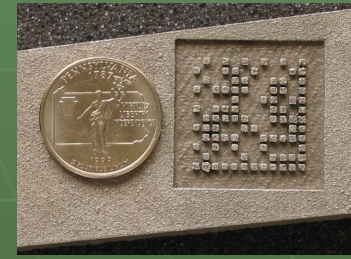
Stencil Marking Methods

STENCIL/INSERT MARKING METHOD	TYPICAL PARENT MATERIALS	APPLIED MATERIALS	MARK CREATION PROCESS
Casting Stencils Mineral fiber bound with clays and binders	Aluminum, Brass, Copper, Gray Iron, Magnesium, SS, Titanium	As Cast	Lost Foam, Lost Wax, Permanent Steel Mold, Permanent Graphite Mold, Sand mold
Thermal Spray Stencils Teflon with high temp adhesive	Ceramics, Glass, Plastics, All Metals	Ceramics, Plastics, All Metals	Portable Oxygen/Acetylene Combustion Spray, Electric Arc Spray, Plasma Spray, HVOF, Spray & Fuse
Molding Stencils & Inserts (New Build) Paper & Teflon Stencils, Porous contrasting inserts	Composites, Plastics, Rubber, Silicones	As Molded	Compression, Injection, Transfer, Wet Lay-up & Autoclave Cure Composites
Molding Stencils & Inserts (Retrofit) Paper & Teflon Stencils, Porous contrasting inserts	Ceramics, Composites Glass, Plastics All Metals	Epoxy, Inks, Paints,	Hand or Automated Screen Transfer, Spray Coatings, Vacuum Bag Bond Down,

- Point-of-Cast Identification Methods

SAND MOLD CASTING OF DATA MATRIX

- Pre-Encoded high temperature stencils are manufactured to the size that will survive repeated overhaul processes.



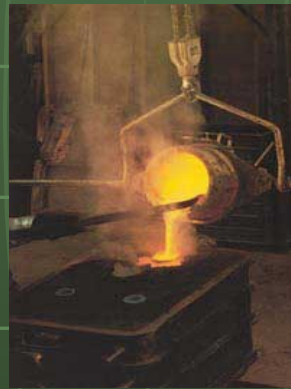
- The stencil is attached to the mold wall using hot melt PSA.



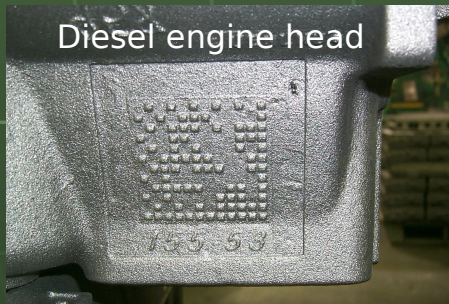
Hot-Melt
Glue System



- Stencil materials have been developed to withstand 3000 degrees F.

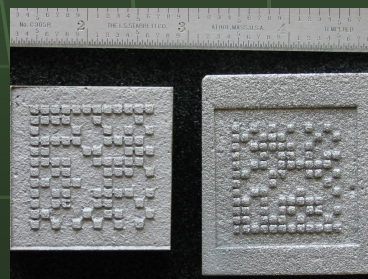


- Stencils can be used when pouring any type of metal.



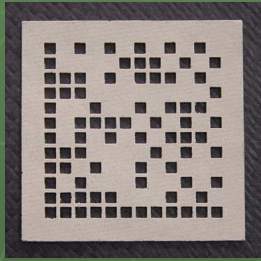
Diesel engine head

- Point-of-cast data symbols can survive repeated overhaul cycles as shown here after shot blast.

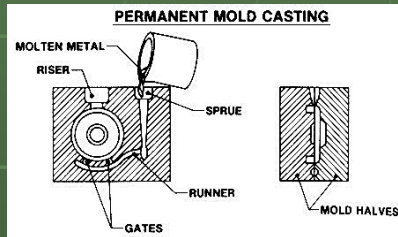


- Transmission Housing.

CASTING DATA MATRIX USING PERMANENT MOLD TOOLING



- Heat activated adhesive backed stencils are pre-encoded prior to use.



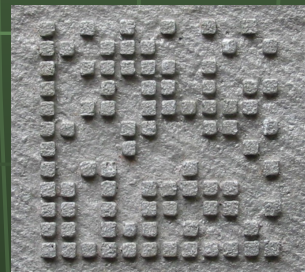
- Stencils are placed on the hot tool in a location low in the mold for maximum head pressure.



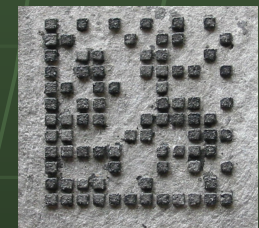
Sand core installation station



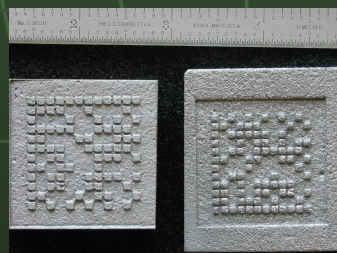
- Permanent molds are coated with a refractory cement to prolong life.



- The results are a complete reproduction of the stencil.

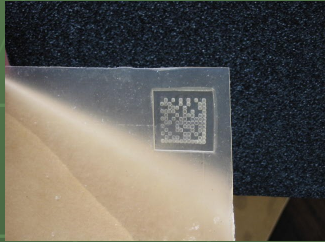
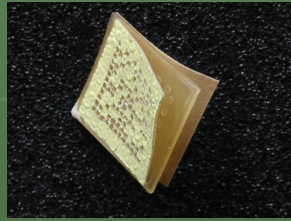
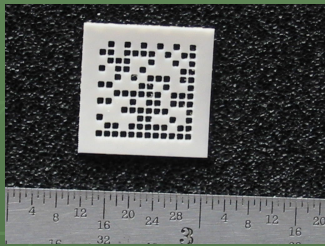


- Point-of-cast data symbols can survive repeated overhaul cycles as shown here after shot blast.

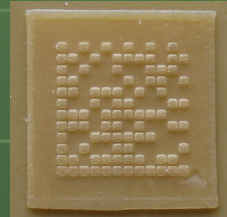


- Contrast for decoding is easily renewable with mill spec ink.

INVESTMENT CASTING DATA MATRIX



.030"
adhesive-
backed wax
with
impression

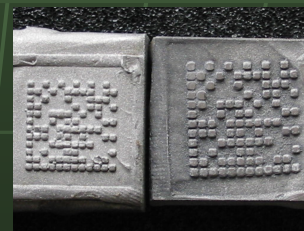
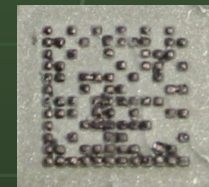


□ Pre encoded Teflon stencils are pressed into adhesive-backed wax to create a wax data symbol stencil.

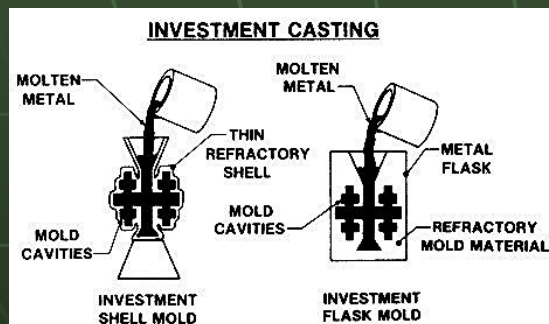
□ The assembly is stuck to the wax pattern and the Teflon stencil is removed and discarded.

□ The pattern is fixed to the tree and the shell mold is applied in layers as a slurry.

□ After the wax is removed, the shell mold is filled with the required alloy.



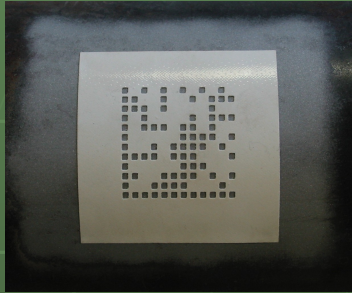
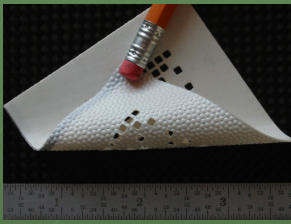
□ Contrast for decoding is easily renewable with mill spec ink.



Thermal Spray Direct Part Marking

- ❑ Combustion Spray
- ❑ Electric Arc Spray
- ❑ High Velocity Oxygen Fuel (HVOF)
- ❑ Spray And Fuse

Combustion Thermal Spray Of Data Matrix



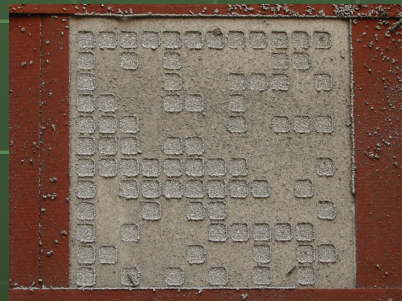
- The pre encoded adhesive backed stencil is positioned on the grit blasted area of the part.



Portable
Combustion Gun



- After a 200 degree pre heat, the chosen powder is applied to the part as shown here with two guns running.



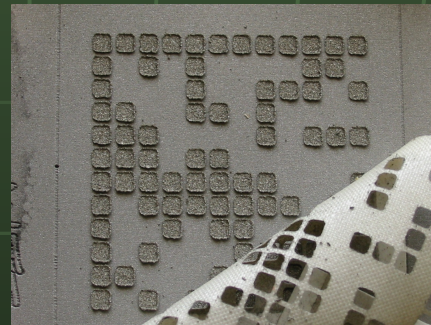
- Shown here is a part prior to damask. 8 passes total.



WC Co Ni Cr B Si

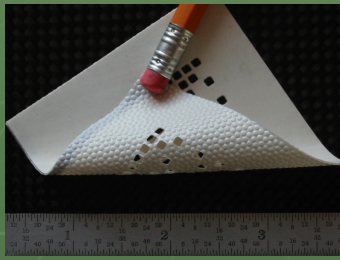


Bronze



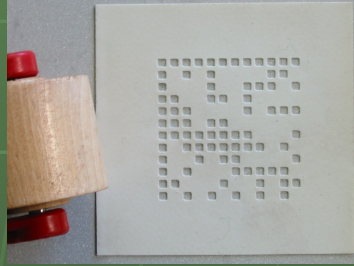
- To the left is a part being damasked. Above is a blued symbol to create contrast.

Data Matrix UID Marks Via Electric Arc



Twin Wire Arc Spray

- The adhesive-backed stencil is rolled down onto the grit blasted part.



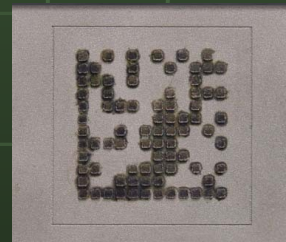
- The part is sprayed using the electric arc spray process.



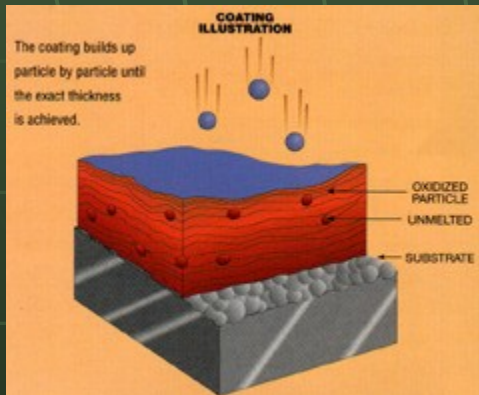
- Here, Ni Al was applied to SS. The stencil removes cleanly leaving no adhesive residue behind.



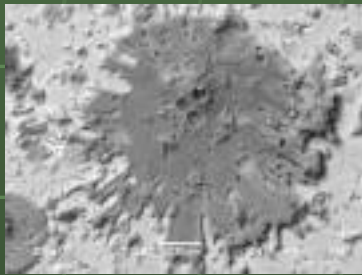
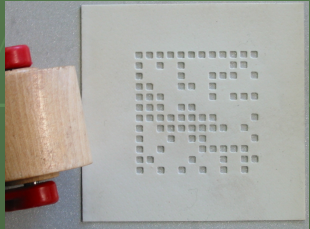
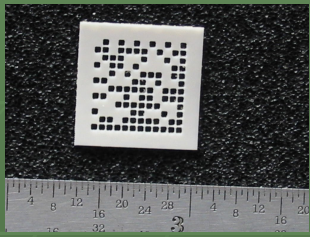
- The aluminum content in the data cells can be treated with chemicals to create contrast.



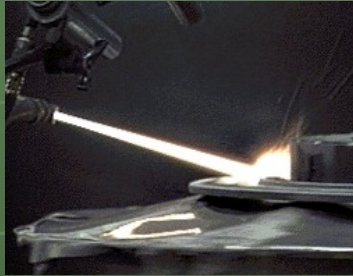
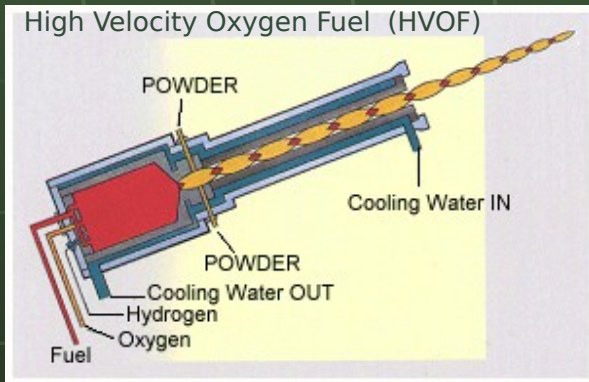
Electric Arc Machine



Using HVOF To Create Data Matrix Symbols



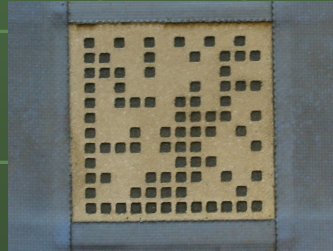
HVOF Particle Hit



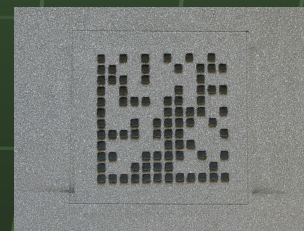
□ The stencil is applied to the part onto the grit blasted area.

□ The part and stencil are shot using The HVOF or plasma process.

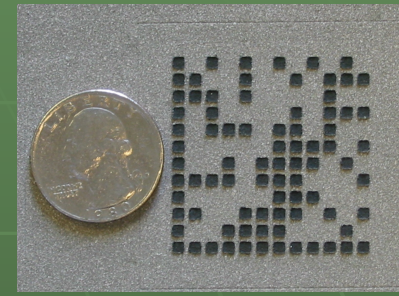
□ Shown here is a Nickel Chrome Oxide HVOF sprayed stencil. The substrate did not exceed 200 degrees F.



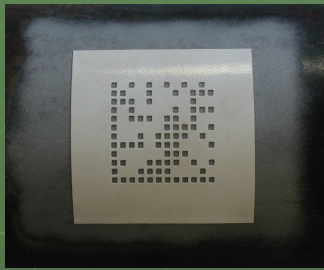
□ The high temperature silicon adhesive on the back of the stencil peels clean.



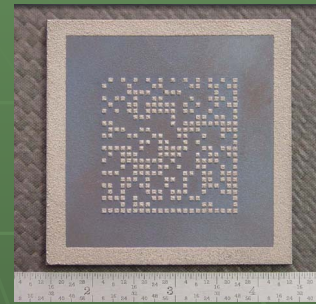
□ The chrome oxide is abrasion resistant and gives good contrast for decoding.



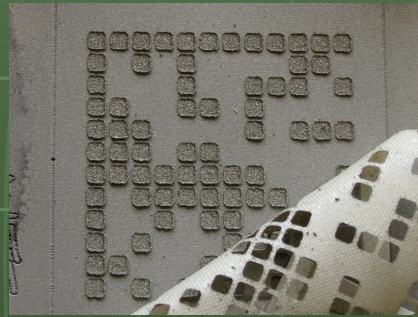
Spray And Fuse Data Matrix



- A stencil is applied to the grit blasted area of a iron substrate and sprayed using a portable combustion gun.



Combustion Gun



- The stencil is removed prior to the fusion operation.



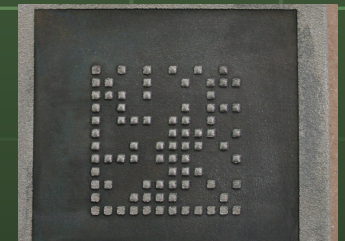
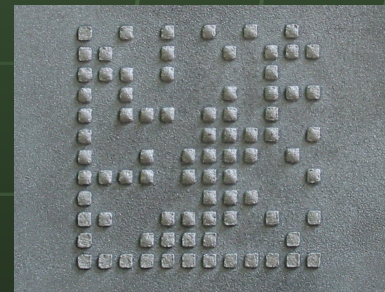
NCMS Fusion
fatigue specimen



- This picture shows a mark being torch fused. A vacuum furnace or nitrogen purged oven will also work. 1750 degrees F fusion temp.

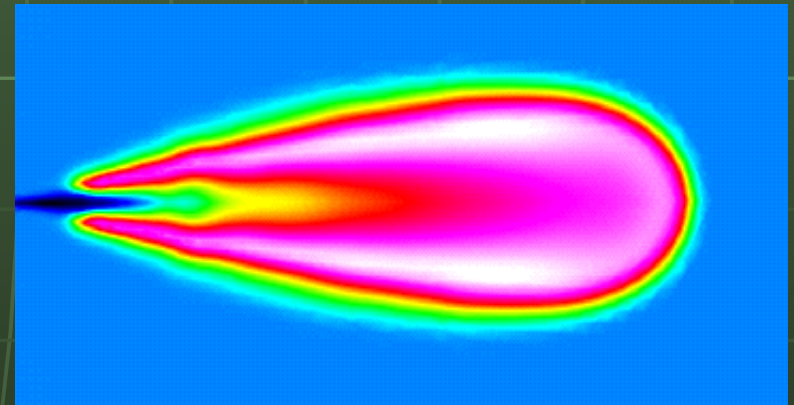
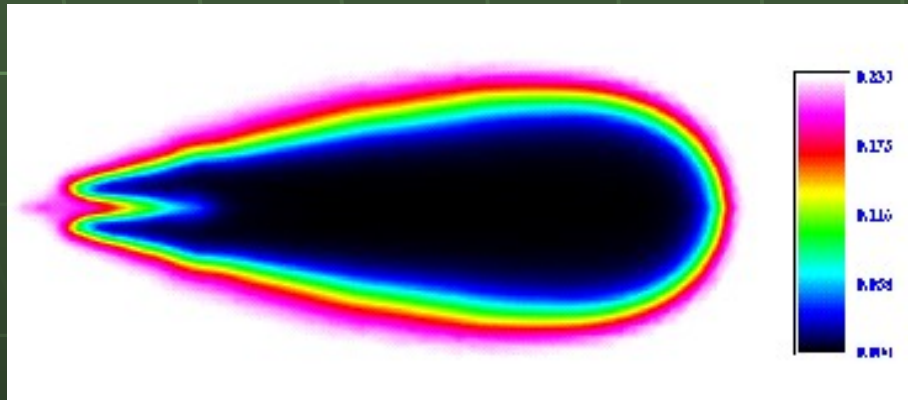
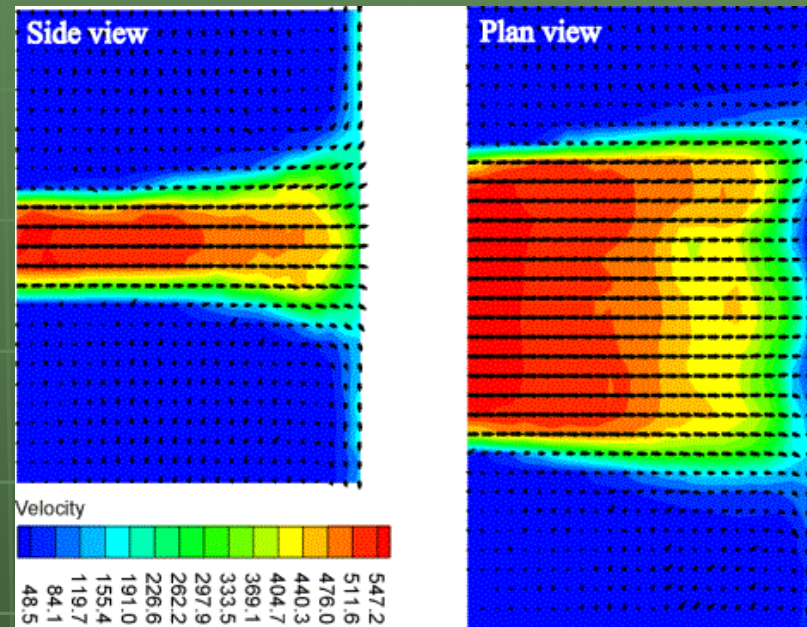


- The fused data cells are rc 58 and have a bond strength of 30,000. PSI. This mark is shown after grit blasting.



- The above picture is the same mark after chemical treatment.

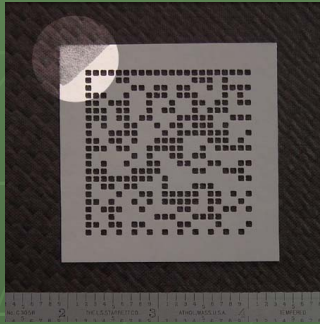
General Thermal Spray Data



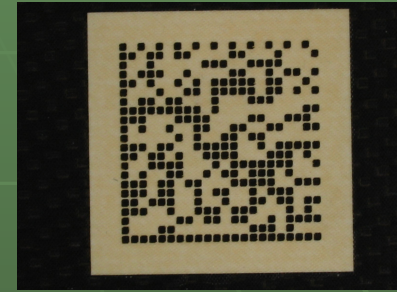
- ❑ Direct Part Marks for Composites

Direct Part Marks for Composites

(New Build) Pre-Preg Carbon Cloth Lay-up



- A .010 " glass mat is lightly impregnated to maintain porosity and contrast.



- The pre-encoded stencil insert is placed in the lay-up on both the tool and bag side.
- A .003" glass barrier layer encapsulates the insert on both the tool and bag side.
- The panel was cured for 15 hours at 350 degrees Fahrenheit.

- The molded in stencil insert provides good contrast.

10X

60X

200X

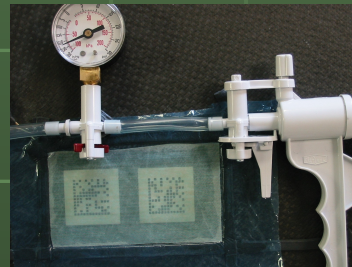
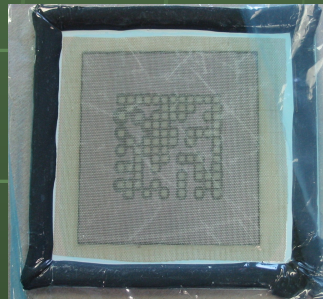
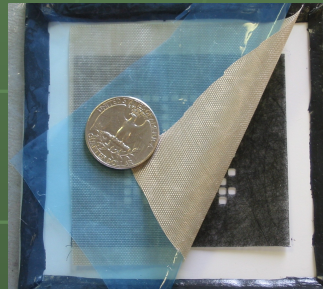
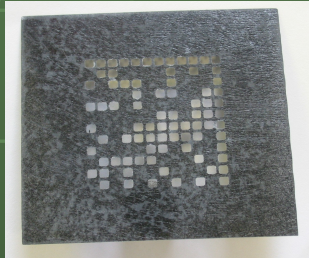
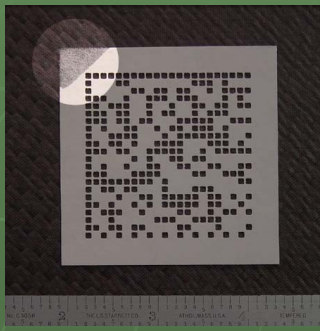
Bag Side



Tool Side



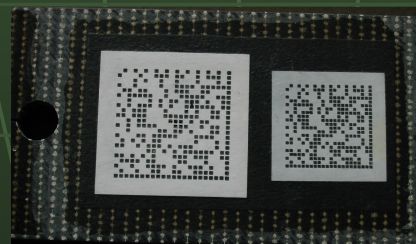
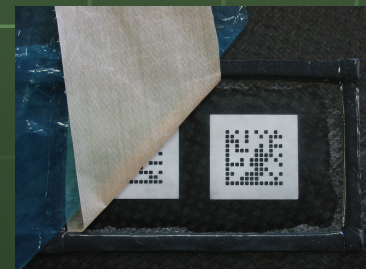
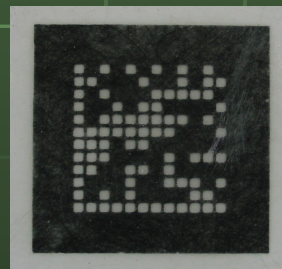
Direct Part Marks for Composites (RETRO FIT) Pre Preg Carbon Cloth Lay-up



□ Fiber stencil inserts can may be made in colors that contrast the substrate. Here a graphite stencil is getting bonded to a white substrate.

□ Here a hand pump is used to pull 25 inches of vacuum to remove air and pull the stencil insert down to the substrate.

□ Shown on the left is the finished graphite insert and on the right is the debagging of white inserts.



□ In this case, a graphite backer was placed behind the white inserts to eliminate the Kevlar stitching from showing through a data cell.



- ❑ Network Based Decoding

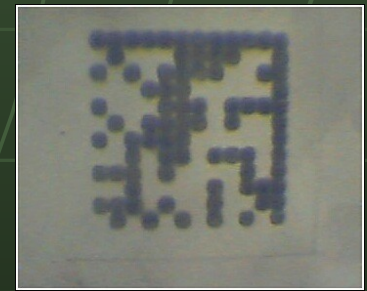
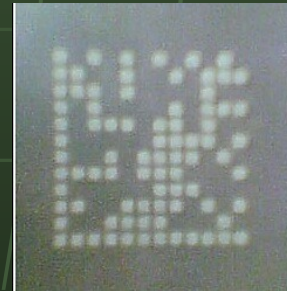
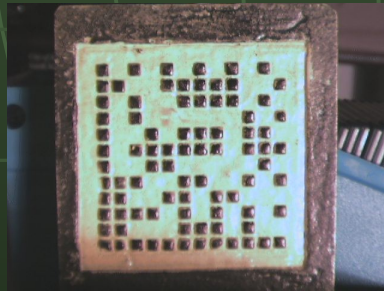
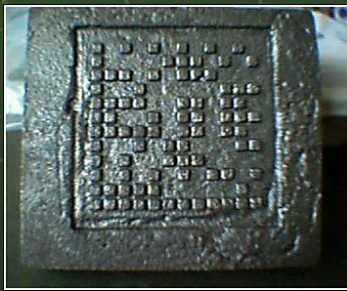
Factory Floor Ethernet Scanning

- Utilize 10/100 Ethernet as an avenue to centralize the decode and data logging process. .
- Inexpensive web cameras with on board I/O are placed in enclosures and easily located on the factory floor. Wired or wireless.
- Difficult to read but fully intact marks are processed with treatment or bump pad printing to create contrast.
- System consists of Perma-code .Net application running RVSI decode algorithm as a control.
- Information transferred to open architecture data base such as MYSQL for IT use.
- System is easily scalable. Unlimited type & number of scan points.
- Harsh environment capable. Explosion proof, wash down, dust.
- Could be a depot stand alone solution with PC & wireless USB camera.

Remote Site Affordable Scanning

www.decodeonline.com

- Web server based decoding and verification
- Provide real-time SPC functions for clients
- Use picture phones and text messaging for remote locations
- Use digital cameras/PC/internet for online remote
- Runs on existing worldwide and company networks
- Offers an affordable easy to implement decode solution for dealers, distribution points, and small military subcontractors
- Planning to providing a decode guarantee through manual mark repair



How Can We Help You?

- We can make stencils for you with quick turn around with your information encoded
- We can provide you with a low cost stencil punch machine with pre-cut stencil blanks
- We can help you with network based decoding
- We can send you sample stencils of various sizes to help determine what will survive the process

Questions?

A copy of this presentation and detailed process specifications on these methods are available upon request